to which the elements, when arranged in the order of their atomic weights, take their place on a kind of chessboard, elements resembling one another being in the same row, have led to the prediction of the existence of new elements; and even unpredicted new elements, such as the remarkable series discovered by Lord Rayleigh and by Sir William Ramsay, have had a fairly comfortable place found for them by extending the chessboard on ground to which it had some legitimate claims.

Inorganic chemistry has developed recently very largely on the physical side. In much of the work, notably in the applications of thermodynamics (and especially of the researches of Willard Gibbs, whose death we lament), the atomic theory plays no part, or but a small one. In the great studies on solutions, however, originated by van 't Hoff, Arrhenius, and Ostwald, the fruitful *ion* theory formulated by these chemists can hardly be regarded as independent of the atomic theory. And yet, in his last book on inorganic chemistry, Prof. Ostwald employs "the forms of the atomic hypothesis as sparingly as ever the present use of language will permit."[1]

In what has preceded, the atomic theory has been regarded from the point of view of utility. Of its utility to chemistry there can be no doubt. It helps us to describe complicated phenomena briefly. The atomic formula $CH_3.COOH$ reminds organic chemists at a glance of a very large number of properties of acetic acid. But, many will ask, is this atomic theory something more than useful? Is it really true?

The subject has been much discussed of late both by men of science and philosophers.[2] One school regards the methods of experimental science as capable of yielding generalisations that are absolutely true, and some of the members of this school do not hesitate to say that the atomic theory is absolutely true. Sir Arthur Rücker concluded his brilliant address to the British Association in 1901 by declaring that "we have a right to insist—at all events till an equally intelligible rival hypothesis is produced—that the main structure of our (*i.e.* the atomic) theory is true; that atoms are not merely helps to puzzled mathematicians, but physical realities." Even in this most positive assertion of Sir Arthur Rücker with regard to the existence of atoms there remains a shade of doubt. Lord Kelvin, in a subsequent speech, showed that in his mind, at any rate, there was none.

There is, however, another school, the origins of which go back far, but which is identified chiefly with Kirchhoff (the discoverer with Bunsen of spectrum analysis), and with his disciples Mach and Ostwald in Germany, and Karl Pearson in England. According to this school, the discovery of "causes" and of ultimate truths is not the business of experimental science. The object of science, according to Kirchhoff, is to describe natural phenomena in the simplest way possible. If a theory like the atomic theory helps us to describe observed phenomena more simply and to discover new ones, let us use it by all means. But (they would say) since the existence of atoms cannot be verified directly,[3] it is really useless for scientific purposes to discuss whether the theory is true or not. Obviously, science here abandons those claims to finality which have been insisted on so strongly by the older and more orthodox school, for our simple descriptions are liable at any moment to be replaced by descriptions still more comprehensive and still more simple. It would be hard indeed to prove that any given theory has attained a maximum of simplicity in summarising the facts with which it deals.

Kirchhoff's self-denying ordinance on the part of science leaves, no doubt, a wider field open to the metaphysicians. But *qui trop embrasse mal étreint;* and the limitations of scientific claims which he advocates may well strengthen science in her own proper borders.

The atomic theory has had a long and venerable history; the "solid, impenetrable" particles of Newton were originated by the Ionian philosophers in the fifth century B.C. A hundred years ago the genius of Dalton gave the theory a fresh and still unfinished career of usefulness, and whether we consider it in the light of a truth that cannot ever disappear from science, or rather as an engine serving to fashion and unite our ideas, possibly to be replaced later by an intellectual mechanism still more efficient, our debt to Dalton remains one of the greatest that the world owes to its great men.

P. J. Hartog.

NOTES.

A special meeting of the Physical Society will be held on Friday, June 5, at 5 p.m., at University College, when Prof. Rutherford, of Montreal, will read a paper on radioactive processes. A discussion will follow, in which it is hoped several prominent physicists will participate.

In reply to a question asked in the House of Commons on Tuesday, Mr. Balfour stated that the Government would contribute to the funds required to send the relief ship *Morning* to the Antarctic at the end of this year, to ensure the safety of the officers and men of the *Discovery*, now ice-bound in Antarctic seas.

The ninth quinquennial conference of the States adhering to the International Telegraph Convention was opened on Tuesday by the Postmaster-General, Mr. Austen Chamberlain, M.P. The business of the conference will go on from day to day until the end of June. Mr. J. C. Lamb, C.B., C.M.G., the principal delegate of Great Britain, was chosen president of the conference, and Mr. John Ardron and Mr. P. Benton vice-presidents.

M. Henri Becquerel, Paris, and Prof. A. Righi, Bologna, were elected honorary fellows of the Physical Society of London at the last general meeting.

The *Daily Mail* announces that Mr. Andrew Carnegie has offered to subscribe 10,000*l.* towards the erection of an experimental tank for testing ship models, as a memorial to James Watt.

Mr. Andrew Carnegie has offered to give 200,000*l.* for a building for the American engineering societies. It is, says *Science*, to be situated in New York City, and will provide an auditorium, a library and headquarters for five engineering societies.

The death is announced of Prof. C. A. Bjerknes, professor of pure mathematics at the University of Christiania, at the age of seventy-eight, and of Dr. G. C. Dibbits, formerly professor of chemistry at Utrecht, at the age of sixty-four.

The death is announced of M. Félix Worms de Romilly, a former president of the French Physical Society, who served for many years on the council, and who in addition contributed liberally towards the cost of certain publications undertaken by the Society.

The *Bulletin de la Classe des Sciences* (Brussels) announces the death, at the age of seventy-six, of M. Charles de la Vallée Poussin, professor of mineralogy and geology of the University of Louvain, and author of important geological papers published in the *Bulletin* itself and in the *Annales* of the geological and scientific societies of Brussels.

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[1] "Principles of Inorganic Chemistry." Translated by A. Findlay, 1902, p. 146. (Macmillan and Co., Ltd.)

[2] See Prof. James Ward's "Naturalism and Agnosticism," 2 vols., 1899.

[3] "No physicist or chemist can produce a single atom separated from all its fellows and show that it possesses the elementary properties he assigns to it" (Sir A. Rücker, *loc. cit.*).

A REUTER message from Stockholm, dated May 22, states that the expedition which is being fitted out to relieve the Nordenskjöld Antarctic Expedition will be provided with stores for three years. It will be under the command of Captain Gylden, of the Swedish navy, who was in charge of the expedition sent to Spitsbergen in 1901 for the measurement of an arc of meridian.

A CORRESPONDENT of the *Times* states that an earthquake was widely felt in Turkish Armenia on April 29. More or less severe shocks were experienced from Van to Baiburt, on the north-west, and it is feared that the loss of life has been extensive. So far no actual details as to the effects of the earthquake seem to have been received, except some relating to the military losses at a town about 100 miles north of Erzerum.

THE annual report to the Conseil de l'Observatoire de Paris, which M. Maurice Loewy is preparing for publication, will contain an account of the recent observations made at Greenwich and Paris for the determination of the difference of longitude between the two observatories. In each observatory a French and an English astronomer made observations independently in the spring and autumn of last year, and a Paris correspondent informs us that the discussion of the two series shows no sensible difference between the French and English results. When the calculations have been completed, the results will be described in papers to be presented at the same time to the Royal Society and the Paris Academy of Sciences by Mr. Christie and M. Maurice Loewy respectively.

THE Australasian Association for the Advancement of Science will hold its next meeting at Dunedin in January, 1904, under the presidency of Prof. T. W. E. David, of Sydney University. The sections and their presidents will be as follows:—A—astronomy, mathematics, physics, and mechanics, Prof. W. H. Bragg; B—chemistry, Mr. J. Brownlie Henderson; C—geology and mineralogy, Mr. W. H. Twelvetrees; D—biology, Colonel W. V. Legge; E—geography, Prof. J. W. Gregory, F.R.S.; F—anthropology and philology, Mr. A. W. Howitt; G—(1) social and statistical science, president not yet appointed; G—(2) agriculture, Mr. J. D. Towar; H—architecture, engineering, and mining, Mr. H. Deane; I—sanitary science and hygiene, Dr. Frank Tidswell; J—mental science and education, Mr. John Shirley.

THE annual congress of the South-eastern Union of Scientific Societies will be held at Dover, June 11–13. On Thursday evening, June 11, the president-elect, Sir Henry H. Howorth, F.R.S., will deliver the annual address. The following papers will be read on June 12:—Atmospheric moisture as a factor in distribution, by Mr. A. O. Walker; experiences of leprosy in India, by Dr. Jonathan Hutchinson, F.R.S.; the diminution and disappearance of south-eastern flora and fauna within the memory of present observers, by Captain McDakin and Mr. Sydney Webb; the seedlings of geophilous plants, by Miss Ethel Sargant; the white chalk of Dover, by Dr. Arthur Rowe; a late Keltic cemetery at Harlyn Bay, by Rev. R. Ashington Bullen. On June 13 Mr. A. T. Walmisley will lecture on international communication.

THE first section of the London County Council's electrical tramways, opened a few days ago by the Prince and Princess of Wales, is of special interest because in the electrification of this tramway the conduit system has been adopted instead of the overhead trolley system, which has been almost universally installed elsewhere throughout the country. The appearance of the line is unquestionably very much superior to that of lines equipped on the overhead system, but it remains to be seen whether it will work equally well in practice; for this reason the working of the new lines will be watched with special interest during the next few years. The cost of installing the conduit system has proved much greater than that of equipping an overhead system, and it is to be hoped that some other advantages will be found to result in working in addition to the gain in appearance, as the district can hardly be said to be one of such great natural beauty that overhead lines would have spoilt it.

THE Middlesex Hospital at the beginning of this year established a complete electrical installation for electro-medical work. The equipment includes all the necessary apparatus for X-ray work, high-frequency, Faradic and galvanic treatment. There are two Finsen lamps for the treatment of lupus, and experiments are also being tried in the treatment of this disease by the Cooper Hewitt mercury vapour lamp. The greater part of the apparatus has been set up in a special temporary building. This is already being found somewhat too small for the number of patients passing through, which amounts to about three hundred a week. Two trollies fitted with apparatus and coils for treatment and radiographic work have also been equipped. It is stated that the results obtained in cases of lupus have been most satisfactory, and that the X-ray treatment of cancer is also giving promising results. The high-frequency treatment of cancer has not been found as yet to justify the claims made in its favour, but further experience and observation are required.

A *Daily Mail* correspondent at Rome states that shortly before eleven a.m. on May 22, an earthquake shock was felt throughout Italy.

ROBINS frequently build in curious places. Miss E. M. Milner sends from Stafford a photograph of a robin's nest built in a small leather handbag that was hung in an arbor near her house. Five eggs were laid and hatched in this nest.

REFERRING to the discovery of a radio-active gas in water by Prof. J. J. Thomson (April 30, p. 609), and the demonstration by Prof. Rutherford that the emanation from radium and thorium is a gaseous body, Mr. W. A. D. Rudge writes to suggest that some interesting results might be obtained from the examination of the gases withdrawn from deep mines for the purpose of ventilation. Mr. Rudge also suggests that these radio-active gases may be of the nature of metallic carbonyls, "because they are the only known metallic compounds which are gaseous to any extent at ordinary temperatures."

THE Meteorological Council has issued a notice stating that it will, as before, supply forecasts of weather during the summer months (June to September inclusive) for the benefit of agriculturists and others as was arranged last year. These forecasts are sent by telegraph at about 3h. 30m. p.m. to those who express a wish to receive them regularly, and who defray the cost of the telegrams, which will be so worded that the cost of each message will be 6*d*. for any one district, including an address of three words. This service of harvest forecasts is, in addition to the ordinary service of forecasts, prepared at 11h. a.m. and 8h. p.m. The harvest forecasts refer to the weather of the next day.

INTERNATIONAL scientific balloon ascents were made on the morning of March 5; the balloons were both manned and others equipped with recording instruments only, while at some stations kites were used. We quote only the preliminary results of the registering balloons, as these attained the greatest altitudes. At Trappes, near Paris, a temperature of −49°·8 C. was registered at 10,000 metres; the reading at starting was 9°·6, and an inversion of 0°·2 occurred at 750 metres. The balloon rose to 15,700 metres, but if readings at higher altitudes than those quoted are suspected of being vitiated by radiation, they are scrupulously rejected. At Strassburg, the temperature at starting was 6°·3, and the following readings were recorded :— −59°·1 at 15,600 metres, −54°·0 at 10,300 metres, −51°·5 at 12,200 metres. A second balloon, on March 6, recorded −62°·1 at 15,330 metres, −51°·2 at 10,200 metres, and −48°·2 at 11,300 metres. At Berlin the following temperatures were recorded :— −57°·0 at 10,400 metres, −51°·0 at 12,000 metres; at starting 4°·4. The type of weather was cyclonic over the British Isles and west of Scandinavia, and anticyclonic over south-west France and eastern Russia.

There has recently been some discussion in the columns of our contemporary *Science* as to who first made use of the word "barometer." It occurred in a paper by Boyle in the *Phil. Trans.* of 1666, and also in an anonymous article in the same journal in 1665. Our valued correspondent, Mr. A. L. Rotch, refers to the use of the word in 1665 in "The General History of the Air . . . by the Honble. Robert Boyle, Esq.," published in London in 1692. We have referred to the work and to the article in question, viz. "A Short Account of the Statical Baroscope, imparted by Mr. Boyl, March 24, 1665. In a Letter to Mr. H. Oldenburgh." As the matter may be of interest to our readers, we quote the sentence (p. 98) :—"When I come to another Place, where there is a Mercurial Barometer, as well freed from Air as mine (for that must be supposed) if taking out my Scale-Instrument, it appears to weigh precisely a Drachm; and the Mercury, in the Baroscope there, stand at 29½ Inches, we may conclude, the Gravity of the Atmosphere, not to be sensibly unequal in both those two Places, though very distant."

During the summer months of the years 1900–1902, the cutter yacht *Walwin*, belonging to Dr. R. N. Wolfenden, was engaged, under the owner's direction, in taking sea temperature observations at the surface and at various depths, and in the collection of samples of water in the channel between the Shetland and Faëroe Islands. The discussion of the observations was entrusted to Mr. H. N. Dickson, who has communicated the results in an interesting paper to the *Geographical Journal* for April. There are two opposing movements of water in the channel, from the south and from the north. The former, or north-moving currents, are of two kinds :—(*a*) drift currents caused by the winds; these are strongest during winter; and (*b*) stream currents, or the Norwegian branch of the European stream; these are strongest during summer. The south-moving currents are also of two kinds :—(*c*) water from the central and western parts of the Norwegian sea, and (*d*) water derived from the melting of ice in the Arctic regions. One of the conclusions drawn by the author is that the movements of the surface waters of the sea and the temperature of the air near the British Isles do not stand in any direct relation of cause and effect. The temperature of the surface water influences the distribution of atmospheric pressure, and will therefore affect the direction of the prevailing winds, but motion has nothing to do with this influence.

An exhibition of mounted heads of the larger mammals and other products of the chase from the German Colonies (Deutsch-Kolonial Jagd-Austellung) has lately been opened at Carlsruhe, under the patronage of the Grand Duke Frederick of Baden. More than fifty persons, who have been out in the German Colonies as officials or in quest of sport, have sent their trophies to it, and a most extensive and instructive series of specimens is the result, which no one interested in the larger game-animals should fail to see. The well-known traveller and naturalist, Oscar Neumann, has contributed the whole of his large African collection. Herr Carl Hagenbeck, of Hamburg, who has long been engaged in getting together a series of heads and horns from all parts of the world, has likewise sent the whole of them to Carlsruhe for exhibition. Amongst the latter the specimens of wild sheep, ibexes and deer from Central Asia have attracted much attention. The collection will be open to view all the summer in the building of the Jubileum Art Exhibition, at Carlsruhe.

Captain Stanley Flower, the director of the Zoological Gardens at Gizeh, near Cairo, is expected to arrive in England about the end of this month, and will bring with him a valuable contribution to the Zoological Society's menagerie. This is a male Grévy's zebra, by far the largest and finest member of the group of African striped asses. There are already two female examples of this beautiful animal in the Zoological Society's Gardens, which have been placed under the Society's care by H.M. the King, so that the acquisition of a male of the same species is eminently desirable. The male in question was obtained for the Society by Colonel Harrington, the British Resident at the capital of Abyssinia, and was brought down as far as Cairo in December last. But it was thought prudent to keep the animal in a warmer climate during the winter season, so it was arranged to deposit it at Gizeh under Captain Flower's care. It is hoped that Captain Flower will likewise be able to bring to England on the same occasion another female of the same species of zebra, also obtained for the Zoological Society by Colonel Harrington.

An important series of statistical articles dealing with the occurrence and incidence of cancer in various countries has been published in the *British Medical Journal*. The main conclusions arrived at are that cancer is prone to attack certain races, especially the Scandinavian and the different branches of the Germanic family, that it is more prevalent in districts in which beer is the staple drink, and that it tends to cause excessive mortality in regions abounding in water, and to a much more marked extent when these are covered with woods or forests.

The well-known salmon disease, since the researches of the late Prof. Huxley, has always been regarded as being caused by the attack of a fungus, the *Saprolegnia ferax*. Recently Mr. Hume Patterson has conducted a research for the Fishery Board for Scotland, and has come to the conclusion that the disease is due to invasion of the tissues of the fish by a special bacillus (*B. salmonis pestis*), which gains access through some abrasion or ulceration of the skin. When the skin of the fish is in a healthy state, the disease is apparently not contracted. The bacillus remains alive in the dead fish, which therefore prove a source of infection, and should immediately be removed and burnt as soon as they are observed.

Various explanations have been given of the cause of the phenomenon of agglutination, the aggregation of the bacteria into clumps, that occurs when an immune serum is added to a bacterial culture. A substance termed agglutinin develops in the serum as the result of immunisation (also frequently during an attack of infective disease, *e.g.* typhoid fever), which combines with some constituent in the bacterial cell. Dr. A. E. Wright suggests that this combination alters the electrical relations of the fluid and suspended particles (bacteria) so that these then offer an appreciable resistance. The electric currents generated by the ionisation of the salts in solution would tend to drive these interposed resisting particles out of the direct line of action, and the displaced particles would all tend to find a position of rest in the angles between the intersecting lines of force, and so clumping would result. (*Lancet*, May 9, p. 1299.)

Much work has of late years been carried out upon the nature and physiological action of the venoms of poisonous snakes. The latest contribution to the subject is a memoir by Captain Lamb and Mr. Hanna upon the venom of Russell's viper (*Daboia Russellii*). They find that Daboia venom owes its toxic property chiefly to its action upon the blood, the rapid death which results being mainly due to extensive clotting of the blood in the blood-vessels. Heating a weak solution of the venom (0·1 per cent.) for half an hour to 73° C. completely destroys the toxicity, though a more concentrated solution (1 per cent.) may have its toxicity only lessened by this treatment. Daboia venom and cobra venom differ in two respects; cobra venom contains a toxic substance of the nature of an albumose, which acts especially upon the central nervous system, and is the essential poisonous constituent, whereas it contains no substance causing intra-vascular clotting. Daboia venom, on the other hand, contains no toxic element having an action similar to that of the toxic albumose of cobra venom. Calmette's anti-venin, which has a powerful neutralising action for cobra venom, possesses little or no such property for Daboia venom. (*Scientific Memoirs of the Government of India*, No. 3, Calcutta.)

Part i. vol. iv. of the *West Indian Bulletin* contains a complete record of the observations of atmospheric phenomena at various points on the island of Barbados during the fall of volcanic ash following the eruption of the St. Vincent Soufrière on March 22 last, together with the results of the chemical analysis of the ash by Prof. d'Albuquerque, and of the mineralogical analysis by Dr. Longfield Smith. The latter states that the minerals present were the same as those found in previous falls, but the relative proportions differed very considerably, the most striking feature, which at once distinguish the late fall from former ones, being the large amount of magnetite and hæmatite present. There was only a small proportion of glass, which was of two kinds—a clear, colourless to brown variety, enclosing microlites and often crystals of felspar, and a translucent to opaque variety, the latter often brown, owing to numerous hæmatite inclusions.

The Imperial Department of Agriculture for the West Indies is giving some attention to the question of improving the corn yield of the islands for estate purposes. At present enormous quantities of corn have to be imported, for the islanders grow corn only as a catch crop, which is often planted at wide distances apart, and little or no attention is given to it. As a result the yield of corn averages only about ten bushels per acre, the quality grown containing 10 or 11 per cent. of protein. In a recent number of the *Agricultural News* it is stated that much better results "may be attained without the aid of elaborate chemical analyses, and with no more apparatus than a pen-knife, an observant eye, and the expenditure of a certain amount of care and time." Based upon the investigations of Prof. Hopkins, of the University of Illinois, simple instructions are given for making a chemical selection of ears of seed-corn by a simple mechanical examination of the kernels, thus enabling farmers to separate the high-protein from the low-protein seeds. It is hoped by adopting this method of corn-breeding to increase the protein yield by about 2 per cent., while the greater care devoted to the cultivation would necessarily lead to a substantial increase in the quantity of corn produced per acre.

An interesting account of the works of the late Sir G. G. Stokes is given by Prof. W. Voigt in the *Nachrichten* of the Göttingen Academy, 1903, part i.

The Actien Gesellschaft für Anilin Fabrikation, of Berlin, send their price list of dry plates, developers, and other requisites for photography, which they manufacture under the registered name of Agfa.

Considerable uncertainty has prevailed as to the existence of conjugation in the Amœbæ. In the *Atti dei Lincei*, xii. 7, Signora Margherita Traube Mengarini publishes a paper on the subject. The authoress has been sufficiently fortunate to observe a process of true conjugation in *Amoeba undulans*, apart from the process of fusion observed by Zaubitzer and Maggi. This process lasts but a short time, and it ends in the complete separation of the animals, so it is difficult to study the phenomenon in its entirety.

In connection with the debated question of the magnetic action of convection currents, MM. Crémieu and Pender have undertaken a series of experiments the results of which are summed up in the *Bulletin* of the French Physical Society. They now definitely prove that metallic surfaces turning in air, either with or without the presence of parallel armatures, produce magnetic effects agreeing to within 10 per cent. of the amounts required by the convection theory. A further mode of experimenting is described by M. Vasilesco Karpen, who produces an alternating convection current by rotating an ebonite disc charged by an alternating current.

M. Léon Guillet contributes some interesting notes to the *Bulletin* of the French Physical Society on the metallography of nickel steel. The steel was of three different classes, the first having the same structure as carbon steel, the second (mertensite) having the structure of tempered steel, and the third a polyhedral structure. It is found that these classes differ notably in their behaviour when subjected to tempering, heating, extreme cold, and decarburation, and M. Guillet finds a close relation between the mechanical properties of the steel and its micrographic structure.

Under the title of *Zeitschrift für wissenschaftliche Photographie, Photophysik und Photochemie*, a new journal has been brought out by Messrs. Ambrosius Barth, of Leipzig. The editors are Dr. E. Englisch (Stuttgart) and Prof. K. Schaum (Marburg), with whom Prof. H. Kayser (Bonn) has cooperated. The first number contains papers on Kirchhoff's laws, by F. Richarz and A. Pflüger; on the photochemistry of silver iodide, by Lüppo-Cramer; and on stereoscopic photography of microscopic objects, by W. Scheffer, the last paper being illustrated by a plate showing stereoscopic representations of a fly and other objects. A noteworthy feature is the collection of abstracts of papers dealing with physical and physiological optics, radiography, photography, and allied subjects, which are to include electricity and wireless telegraphy.

Those who are engaged in the teaching of elementary experimental physics will find a mine of wealth in Prof. Bohn's newly-published illustrated catalogue of instruments and models taken from the Schäffer Museum. The late Hermann Schäffer, whose death was announced in 1900, and who held a chair of mathematics and physics at the University of Jena from 1856 onwards, devoted a large portion of his lifetime to the formation of this collection, which consists of models and instruments constructed for the express purpose of illustrating in the clearest and simplest way the elementary properties of matter, light, heat and electricity. Prof. Bohn describes about 350 apparatus out of a collection of many thousands now housed in the Zeiss Institution in Jena. A noteworthy feature of Schäffer's methods was the great use he made of glass in order that his pupils might see the complete working of the experiments.

We have received a copy of the second number of a new paper called the *British Inventor*. The new journal contains a few brief notes on scientific novelties, but is chiefly concerned with popular and trade aspects of invention.

We have received a copy of a catalogue of the Romanised geographical names of Korea, compiled by Prof. B. Kotô and Mr. S. Kanazawa, of the Imperial University of Tōkyō, Japan. The catalogue is published by the Tōkyō University, and should prove of great assistance to travellers in the interior of Korea.

Five more parts of the first annual issue of the "International Catalogue of Scientific Literature" have just been published. These newly issued volumes include the second part of vol. iv., which deals with works on physics; vol. x., mathematical and physical geography; vol. xi., mineralogy, including petrology and crystallography; vol. xii., geology; and a volume giving a list of journals with the abbreviations used in the catalogue as references.

There has been issued from the Government Printing Office, Washington, U.S.A., a reprint of a "Bibliography of Cooperative Cataloguing and the Printing of Catalogue Cards (1850–1902)," by Messrs. Torstein Jahr and Adam J. Strohm, which was included in the report for 1902 of the Librarian of Congress. In view of the cooperative plans of the Royal Society, the Brussels Institut international de bibliographie, and the Concilium bibliographicum at Zurich for the production of international catalogues of scientific works, the publication of this list of works should interest many European men of science.

Parts I. and II. of the *Transactions* of the Royal Society of Edinburgh, dealing with the work of the sessions 1900–1902, have now been published by Messrs. R. Grant and Son, of Edinburgh, and Messrs. Williams and Norgate, of London. Among the twenty contributions to the two volumes, the following may be mentioned as of wide scientific interest: Dr. Masterman's contribution to the life-histories of the cod and whiting; the second part of Sir William Turner's study of the craniology of the people of the Empire of India; Mr. Aitken's notes on the dynamics of cyclones and anticyclones; Mr. Harker's paper on ice-erosion in the Cuillin Hills, Skye; and Dr. Scott's investigation of the primary structure of certain palæozoic stems with the Dadoxylon type of wood. The reports published from time to time in our columns of the meetings of the Royal Society of Edinburgh make any detailed reference to the contents of these volumes unnecessary.

Second editions have been issued of Mr. M. M. Pattison Muir's translation of Dr. Robert Lüpke's "Elements of Electro-chemistry Treated Experimentally" (Messrs. H. Grevel and Co.), and of Mr. George Massee's "Text-book of Plant Diseases caused by Cryptogamic Parasites" (Messrs. Duckworth and Co.). Mr. Pattison Muir has incorporated the important changes and additions made by the author in the third German edition, and also added about a dozen new illustrations. Mr. Massee has taken the opportunity to deal in the new edition of his book with several destructive diseases which either have appeared for the first time or have developed and extended to an alarming extent since the appearance of the first issue of his work.

The fifth edition of the "Introduction to the Study of Metallurgy," by the late Sir William Roberts-Austen, published by Messrs. C. Griffin and Co., Ltd., was fortunately completed by its distinguished author before his death, and has now made its appearance. The book has again been enlarged and improved, and in its present form is necessary to every student of metallurgy who desires to obtain a general view of his subject. Besides being one of the most readable of scientific works, it will provide Sir William Roberts-Austen's many friends with an interesting memento. The two presidential addresses delivered by the author before the members of the Iron and Steel Institute in 1899 and 1900 are printed in an appendix, and the whole volume is a token of the interest he took in the welfare of his students.

The latest issue of the memoirs of the Société de Physique et d'Histoire Naturelle de Genève contains the president's report for the year 1902, together with a monograph by the late M. Marc Micheli on the Leguminosæ collected in the Mexican States of Michoacan and of Guerrero during 1898 and 1899 by the late M. Eugène Langlassé. The voyage of M. Langlassé had utilitarian ends in view, and his attention was especially directed to plants of interest to the horticulturist, and likely to prove important from the point of view of agriculture, rather than for their scientific interest. Notwithstanding this fact, the number of new species contained in his collection shows conclusively that many new forms will be forthcoming when the country visited by M. Langlassé is systematically explored by competent botanists. Among the 237 kinds of leguminous plants collected, M. Micheli described twenty-six as new species, and he admits one new genus. The monograph is accompanied by twenty-eight beautifully executed plates, which serve as an admirable accompaniment to what proved to be the last piece of work of the author.

In accordance with a resolution passed at the International Geological Congress at Paris in 1900 to establish a palæontological publication to bring together illustrations and descriptions of type-fossils, an international committee was appointed to prepare a programme of the publication which is to be known as "Palæontologia Universalis." The commission will publish each type-fossil on a separate plate. It has been arranged to reproduce the original figure of the type-fossil, to give a phototypographic figure of the type itself, the original description without alterations or abbreviations, and additional observations by the authors. The two specimen plates which have reached us are excellent, and the series, when complete, should be of great service in making known rare and frequently unknown descriptions and figures of type-fossils. The assistance of numerous palæontologists has been secured, and they will prepare the plates of the type-fossils of the greatest interest in the collections in their care. Dr. von Zittel is president of the committee, and M. D. P. Œhlert is the secretary. The British members are Messrs. F. A. Bather and A. Smith Woodward. The annual subscription is 1*l*. 12*s*., which should be sent to Messrs. William Wesley and Son, 28 Essex Street, W.C.

The extraction of the perfume from flowers such as jasmine, tuberose, violet and cassia has long been carried out by the process of enfleurage, the blossoms being left in contact with purified lard for a few days, and then replaced by fresh blossoms. The lard is either sold as such, or the essential oil may be extracted from it by melting it under strong alcohol. As the process of enfleurage is somewhat tedious, attempts have frequently been made to extract the oil directly from the flowers by means of light petroleum, but these processes have not as a rule proved successful, and it has recently been found that a very large proportion of the perfume is actually produced for the first time in the blossoms during the time occupied by the enfleurage. An interesting illustration of this is given by Dr. Albert Hesse in a recent number of the *Berichte*, in which he states that a ton (1000 kilos.) of tuberose blossoms only yielded 66 grams of oil when extracted with light petroleum, but during enfleurage yielded 801 grams of oil to the fat in which they were embedded, whilst a further 78 grams remained in the faded blossoms and could be separated by extraction or distillation. It thus appears that eleven times as much perfume is produced during enfleurage as is originally present in the flowers, and that even after enfleurage the exhausted flowers contain more perfume than when first gathered.

The additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Captain Lambert Larking; a Naked-footed Owlet (*Athene noctua*) from Holland, presented by Mr. R. Souper; a Common Cormorant (*Phalacrocorax carbo*), British, presented by Mr. C. F. McNiven; a Nilotic Trionyx (*Trionyx niloticus*) from West Africa, presented by Mr. Henry Reeve; a Common Chameleon (*Chamoeleon vulgaris*) from North Africa, presented by Mr. M. J. Comyn; three Suricates (*Suricata tetradactyla*) from South Africa, ten Black-spotted Lizards (*Algiroides nigro-punctatus*) from Madeira, deposited; a Thar (*Hemitragus jemlaica*), a Burrhel Wild Sheep (*Ovis burrhel*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

Astronomical Occurrences in June:—

June 3.	Predicted perihelion passage of Faye's comet.
,,	15h. Mars in conjunction with moon. Mars 1° 49′ N.
8.	12h. 10m. Minimum of Algol (β Persei).
15.	Venus. Illuminated portion of disc = 0·613, of Mars = 0·885.
,,	11h. Uranus in opposition to the Sun.
17.	Juno 1° N. of μ Serpentis (mag. 3·6).
,,	14h. Jupiter in conjunction with the moon. Jupiter 3° 7′ S.
19.	11h. 31m. to 14h. 55m. Transit of Jupiter's Sat. IV. (Callisto).
20.	12h. 52m. Transit (egress) of Jupiter's Sat. III. (Ganymede).
22.	3. Sun Enters Gemini. Summer commences.
27	9h. 28m. to 10h. 5m. Moon occults α Cancri (mag. 4·3).
,,	13h. 36m. to 16h. 46m. Transit of Jupiter's Sat. III. (Ganymede).
,,	16h. Mercury at greatest elongation 22° 5′ W.

Variability of Nova Geminorum.—A note from Prof. E. C. Pickering which appears in No. 3868 of the *Astronomische Nachrichten* states that the light of Nova Geminorum appears to be fluctuating in a manner similar to that of Nova Persei, No. 2. During the twenty-four hours preceding the evening of May 1, it had increased by half a magnitude.

The nature and amount of these fluctuations will be seen from the following table of measures made at Harvard:—

Date.	Magnitude.	Date.	Magnitude.
April 24 ...	9·37	April 29 ...	9 61
,, 25 ...	9·67	,, 30 ...	9·76
,, 27 ...	9·71	May 1 ...	9·26
,, 28 ...	9·81		

Origin of the H and K Lines of the Solar Spectrum.—In a paper communicated to the April number of the *American Journal of Science*, Prof. J. Trowbridge, of Harvard University, gives the results he has obtained from a series of careful experiments which he made in order to determine the constitution of the H and K lines in the solar spectrum, and also discusses the nature of reversed lines in gaseous spectra.

By a series of preliminary experiments he arrived at the conclusion that the lines which he obtained coincident with the calcium lines were not due to any calcium in the glass tubes or the terminals used in obtaining the spark, and further he argues that, even if the glass did contain calcium, the duration of the spark was not sufficiently long to raise the temperature of the glass high enough for it to produce a spectrum, whilst in obtaining his spectra he photographed a part of the spark which was far enough removed from the terminals to ensure the absence of metallic particles ejected by them.

Using quartz tubes sealed by metallic ends he obtained the reversed line at λ 4227, and also lines coincident with the solar lines 3968 and 3933, quite as strong as when a glass tube was used, whilst the other strong calcium lines towards the ultra-violet were conspicuously absent.

Prof. Trowbridge found that the spectra obtained from a highly disruptive spark discharge between electrodes of some metals do not show these lines, whilst those obtained from a similar spark between other metals, *e.g.* pure silver, platinum and iridium, do show them; he suggests that in the former case the metals are easily volatilised, and their vapours conduct the spark, whereas in the case of the latter class of metals the air conducts the discharge because no metallic vapours are produced, and therefore it is some gaseous constituent of the atmosphere which produces the lines in question. For similar reasons he believes that some lines at present attributed to silicon—another highly refractive substance—are possibly atmospheric.

From these observations Prof. Trowbridge arrives at the following conclusions:—"At the basis of the great H.H lines of the solar spectrum there are strong gaseous lines which I believe to be oxygen lines. The reversed lines which apparently coincide with certain calcium lines are not due to calcium but are gaseous." Reproductions of four spectrograms, which accompany the article, illustrate the reasons for these conclusions.

The Leeds Astronomical Society.—The tenth annual issue of the *Journal and Transactions* of this Society contains a series of useful papers which were communicated to the Society by its members during 1902. Amongst others there are papers on "Parallax," "Velocities, Paths and Eclipses in the Solar System" (illustrated by diagrams of the various orbits), "The Age of the Earth," "Brightness and Definition," and "The Year's Observations" (which were in the most part observations of Jovian phenomena), all of which should prove of value and interest to amateur astronomers.

The *Journal* concludes with a collection of the papers and letters communicated to other journals by the members of this Society during 1902.

THE ADVANCEMENT OF PHOTOGRAPHY.

At the recent meeting of the Royal Photographic Society held to celebrate its jubilee, the president, Sir William Abney, K.C.B., F.R.S., suggested, in an address of which an abridgment is given below, that the Society should further mark the close of the first fifty years of its existence by establishing laboratories and suitable accommodation for the carrying out of photographic researches. A donation of 100*l.* has already been promised, on condition that 900*l.* more is raised for this purpose. The establishment of such facilities is highly desirable, for, excluding the work of a few whose names may be counted on the fingers of one